## REMARKS

Claims 1-16 and 28 are pending in this application. By this Amendment, claims 1, 13, and 15-16 are amended, claims 17-27 are canceled without prejudice to or disclaimer of the subject matter contained therein, and claim 28 is added. No new matter is added.

Applicants thank the Examiner for the indication that claim 15 contains allowable subject matter. Claim 15 is amended to be in independent form and to clarify the terminology. Accordingly, claim 15 is believed to be in condition for allowance.

The Office Action objects to claims 13 (second occurrence) -26 for being misnumbered. The Examiner has re-numbered these claims as claims 14-27 for examination purposes. This objection is respectfully rendered moot because Applicants' April 6, 2001 Preliminary Amendment has already made these specific numbering changes. Accordingly, withdrawal of the objection is respectfully requested.

The Office Action also objects to claims 17-27 under 35 U.S.C. §101. By this Amendment, claims 19-27 are canceled and claims 17-18 are amended to clarify that the claims are directed to a computer-implemented method. Because claims 17-18 are directed to statutory subject matter, withdrawal of the rejection is respectfully requested.

The Office Action rejects claims 1-2, 4-14 and 16-27 are rejected under 35 U.S.C. §102(b) over U.S. Patent No. 5,392,382 to Schoppers. This rejection is respectfully requested.

The claims are directed to a distributed actuation allocation system (smart matter system) and method that control a plurality of individual implementation units or actuators 150 (such as robotic actuators or air jets) in a distributed, decentralized manner. As indicated in Applicants' paragraph [0002], a major problem is faced by the need to coordinate the actions of many elements to obtain a desired goal by controlling the cumulative action of a

number of individual actuators. The possible solution increases exponentially with the number of actuators to control. Also, allocation using nonlinear programming requires centralized knowledge of all system component status, which increases the need for communication among system components.

Applicants' system and method overcome these problems. Independent method claim 13 is revised for clarity and allocates a system instruction (or goal) by grouping a plurality of actuators (150) into modules (170, 180), each comprising one or more actuators or sub-modules containing one or more actuators. At least one allocator, such as 191 in Fig. 1, then partitions the system instruction or goal into sub-instructions one for each module to perform based on an allocation parameter (such as location of modules or a weighting factor). This can be performed without the need to know the specific capabilities or status of individual actuators within all of the modules. If the module contains only individual units 150, the sub-goal or sub-instruction for the module is used to actuate one or more individual units in the module to implement the sub-instruction (for example, see module 170 branching from allocator 195 in Fig. 1). If, however, the module includes various sub-modules (for example, see module 180 in Fig. 1) each containing individual units, then the sub-instruction is sent to at least one of the sub-modules within the module (where it may be further partitioned into second sub-instructions and sent to a lower level of sub-modules as in claim 15). Independent system claim 1 has been amended to conform to the method of claim 13.

The subject matter of claims 1 and 13 allows a high level solution or goal to break an allocation problem into smaller problems that can be solved locally in a optimal way for an arbitrary grouping of units. That is, it is difficult to determine an optimal solution to control a large, arbitrary number of actuators, say 10 or more or even 10,000 or more. The more there are, the more difficult the optimization. However, by grouping the units (actuators) into

modules and defining a sub-goal or instruction for each module, the problem can be broken down into smaller problems that can either be solved locally by each module, resulting in actuation of individual actuators in the module or further partitioned into smaller sub-modules until finally, a lowest level of the module will contain individual actuators that can be actuated by the sub-instruction sent to the lowest level sub-module.

Schoppers is not concerned with problems involving large numbers of actuators. Rather, Schoppers is directed to developing universal plans to achieve specific goals by defining a hierarchy of rules for a system "in order to determine the proper order for taking action to accomplish sub-goals" (col. 3, lines 44-48). Schoppers operates and controls at only the system level and requires sensing of all relevant conditions of the system (col. 4, lines 55-56). All sensed information is fed to a <u>central</u> processing unit (col. 5, lines 1-2) for feedback in developing the universal plan. Although goals are broken down into sub-goals, Schoppers only describes the ordering of the goals to achieve an objective. This objective is achieved collectively. Thus, Schoppers suffers from the same problems overcome by the invention.

With respect to independent claims 1 and 13, Schoppers fails to group actuators into <u>modules</u>. Schoppers also fails to <u>partition</u> the system instruction or goal into a plurality of sub-instructions <u>for each of the actuator modules based on an allocation parameter</u> and then allocating each sub-instruction or goal to a particular module. Instead, if anything, Schoppers teaches against this by teaching a centralized control. Thus, Schoppers does not have sub-goals specifically allocated to groups of modules of actuators as claimed to achieve a distributed control.

Schoppers also fails to allocate each of the sub-instructions to a sub-module if the module contains one or more sub-modules. Schoppers also fails to actuate one or more

actuators within a particular module based on the sub-goal or instruction for that module when the module contains at least one actuator and does not include further sub-modules.

Because Schoppers fails to teach each and every feature of independent method claim 13 or independent system claim 1, these claims and claims dependent therefrom are not anticipated by Schoppers.

New dependent claim 28 is a system claim that corresponds to allowable method claim 15 and is allowable for similar reasons.

Withdrawal of the rejection is respectfully requested.

The Office Action rejects claim 3 under 35 U.S.C. §103(a) over Schoppers in view of U.S. Patent No. 6,039,316 to Jackson. This rejection is respectfully requested.

Schoppers is discussed above. Jackson fails to overcome the deficiencies of Schoppers with respect to independent claim 1. Accordingly, claim 3 is deemed allowable for its dependence on allowable base claim 1 and for the additional features recited therein. Withdrawal of the rejection is respectfully requested.

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1-16 and 28 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

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